

THE WEATHER AND CIRCULATION OF NOVEMBER 1958¹

A Mid-Month Reversal of Weather Regimes

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1. INTRODUCTION

It was found by Namias [7] that for the period 1942–50 the month-to-month persistence of temperature, precipitation, and 700-mb. height anomaly in the United States was less from October to November than for any other pair of adjacent months. Recent Novembers [4, 10] have confirmed the fact that abrupt changes often take place between those months. In his study, Namias also indicated that intramonthly fluctuations are common in November. November 1958 conformed, as a reversal in both temperature and precipitation was observed between the first and second halves of the month, with associated changes in the 700-mb. height field and its jet stream. As a consequence of these changes, the eastern portion of the Nation became warmer and wetter, while the West turned colder and drier.

Because of the contrasting regimes that occurred during the month, it is difficult to discern in the monthly mean circulation underlying physical explanations of temperature and (especially) precipitation anomalies. For this reason the monthly circulation was divided into two 15-day periods to facilitate the association of observed anomalies with the changing circulation.

2. CIRCULATION OF NOVEMBER 1–15, 1958

The 15-day mean 700-mb. chart for the first half of November (fig. 1A) showed a mean trough of small amplitude off the east coast of North America, extending from Cape Hatteras to Newfoundland and thence northward, terminating in northwestern Greenland. A somewhat similar position was occupied by a mean trough last month [1]. The blocking over central Canada, which was so prevalent during September [2] and October, relaxed during this period. This is indicated by the small amplitude of the major ridge over the western portion of North America. The associated mean trough downstream also flattened, resulting in 700-mb. heights averaging below normal over almost all of North America, with centers of maximum departure from normal over southwestern Canada, eastern Alaska, and Nova Scotia. Over the United States small height anomalies and rather strong zonal flow were observed during the first half of the month. In this period the jet stream at 700 mb. was

generally oriented east-west, except in the middle portion of the country where a southward dip of the jet occurred before it exited over North Carolina (fig. 2A).

It is characteristic of high-index type flow that numerous fast-moving minor perturbations may manifest themselves as mean minor troughs, especially to the leeward of mountains. Such a trough developed in the strong zonal flow over the Central States. It is interesting to note that this trough formed at the base of maximum curvature of the jet stream (fig. 2A). While this position is somewhat removed from the influence of the Rocky Mountains, it is located in a position of maximum 30-day mean trough frequency for November [6]. Thus, a composite of factors resulted in the minor trough through that area.

The strong ridge in the mid-Pacific, which was clearly marked by a large area of positive anomaly during the month of October, was replaced by a well-defined trough. This split the central Pacific ridge into two cells; one located in the west-central Pacific and the other in the eastern Pacific. Associated with these changes, the trough of October in southwestern United States was propagated eastward. The positions of the troughs and ridges in the Pacific over the middle latitudes and over most of North America closely corresponded to those in September [2], also a month of high index flow over the United States.

The eastern Atlantic ridge intensified from October to November and resulted in an especially strong departure from normal (+420 feet) off the coast of Europe (fig. 1A). The amplification continued downstream, marked by the intensification of the trough from central Europe southward to north-central Africa.

In response to this amplification, intense ridging occurred over eastern Europe just west of the Ural Mountains, culminating in a departure from normal of +540 feet over east-central Russia where 700-mb. heights had been a little below normal in October. Meridional flow was observed over the European continent, in contrast to the zonal flow over North America. The pattern over most of Asia was similar to that over the Western Hemisphere, with flat wave systems and a relatively smooth anomaly pattern.

The Low centered over the North Pole in September

¹ See Charts I–XVII following p. 456 for analyzed climatological data for the month.

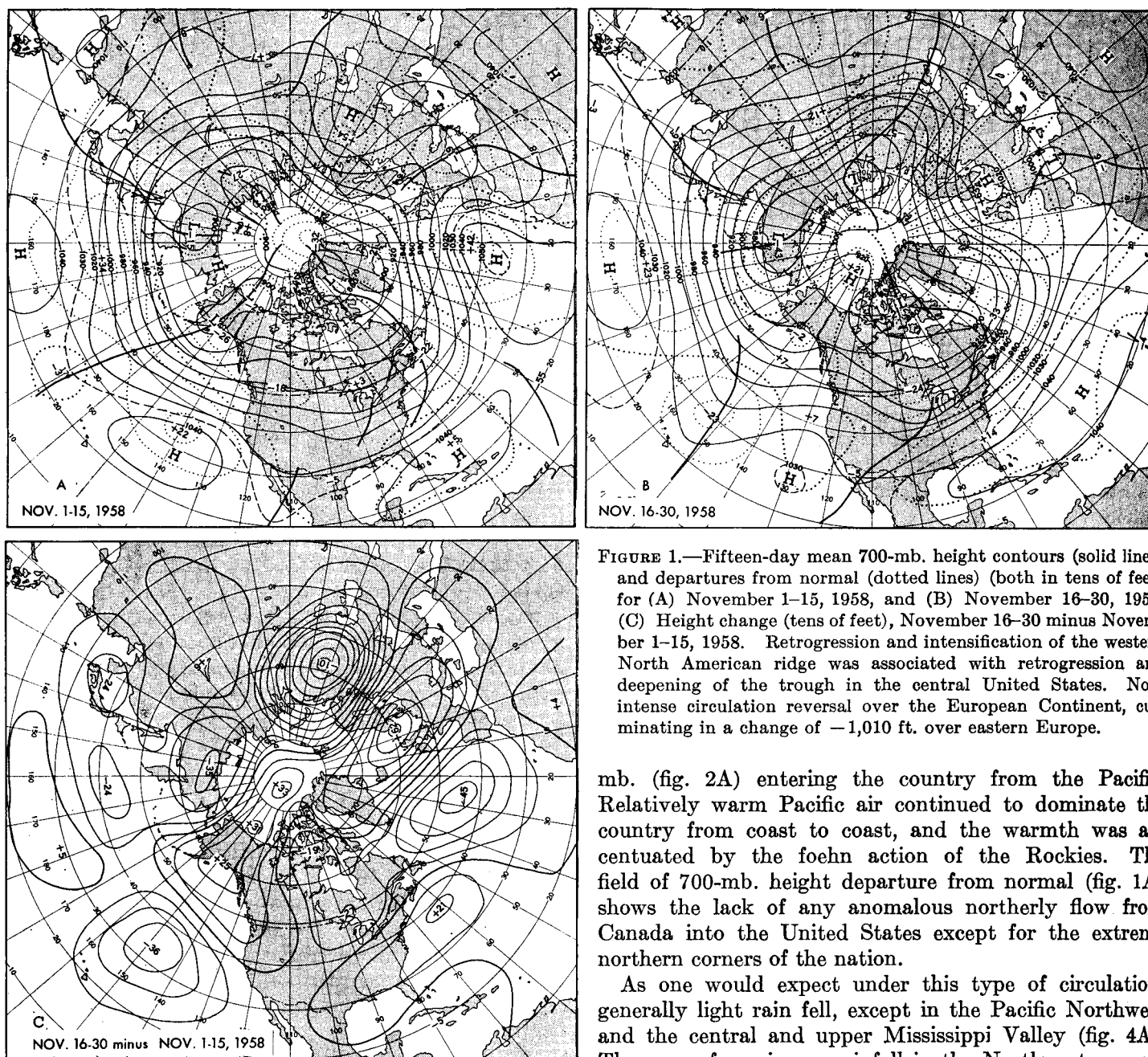


FIGURE 1.—Fifteen-day mean 700-mb. height contours (solid lines) and departures from normal (dotted lines) (both in tens of feet) for (A) November 1–15, 1958, and (B) November 16–30, 1958. (C) Height change (tens of feet), November 16–30 minus November 1–15, 1958. Retrogression and intensification of the western North American ridge was associated with retrogression and deepening of the trough in the central United States. Note intense circulation reversal over the European Continent, culminating in a change of $-1,010$ ft. over eastern Europe.

mb. (fig. 2A) entering the country from the Pacific. Relatively warm Pacific air continued to dominate the country from coast to coast, and the warmth was accentuated by the foehn action of the Rockies. The field of 700-mb. height departure from normal (fig. 1A) shows the lack of any anomalous northerly flow from Canada into the United States except for the extreme northern corners of the nation.

As one would expect under this type of circulation, generally light rain fell, except in the Pacific Northwest and the central and upper Mississippi Valley (fig. 4A). The area of maximum rainfall in the Northwest was associated with the jet at 700 mb. (fig. 2A) carrying moist maritime airmasses against the mountainous terrain. Notice the drying effect of the Rocky Mountain range as the jet moved southeastward from Montana to northeastern Nebraska and Missouri. Moderate to heavy rainfall in the Mississippi Valley was related to the minor 700-mb. trough there, as small perturbations produced rainfall, aided by a flow of moist southerly winds.

4. MID-NOVEMBER CIRCULATION TRANSITION

The 15-day mean 700-mb. chart for November 16–30, 1958 (fig. 1B), shows the Alaskan Low replaced by a blocking High, with a maximum anomaly of $+210$ ft. (fig. 1B), situated between Alaska and the North Pole. This anticyclogenesis affected the general circulation over both the Pacific Ocean and the North American continent.

reached its maximum intensity in October, with an anomaly of -420 feet. In November this large negative anomaly split, with a portion swinging into Alaska and another section into northern Greenland, while a small positive anomaly developed in extreme north-central Canada.

3. TEMPERATURE AND PRECIPITATION ANOMALIES OF NOVEMBER 1–15

The temperature anomaly (fig. 3A) clearly illustrates the abnormally warm nature of the first half of November. The largest departures from normal occurred over the central portion of the country, with extremes of as much as $+10^{\circ}$ F. in Kansas and western Missouri. The warmth was the result of fast westerlies in high index circulation, as indicated by the strong jet stream at 700

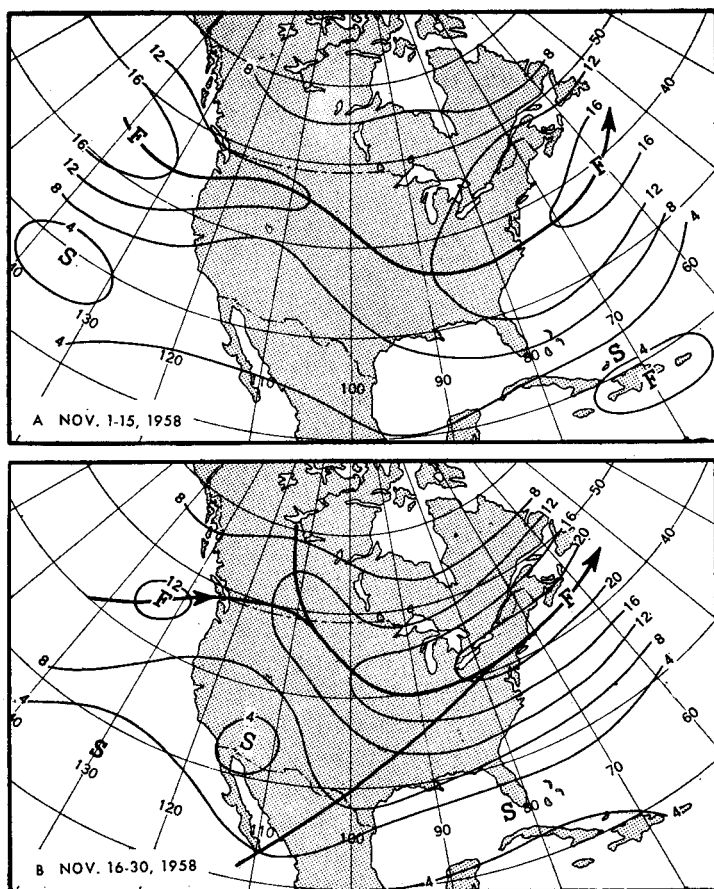


FIGURE 2.—Fifteen-day mean 700-mb. isotachs (meters per second) with position of the primary jet axes given by solid arrows for (A) November 1-15, 1958, and (B) November 16-30, 1958. The development of a northerly jet out of central Canada and a southwest jet from Texas, plus a slight northward shift from the first to the second halves of the month, were associated with cooling and drying in the West and warming and more precipitation in the East.

The west coast ridge retrograded and built over the northern two-thirds of the area, while the southern portion became weaker. Downstream, the minor trough that had been located in the Central States during the first half of the month (fig. 1A) retrograded and joined with the southwest trough to establish a major 700-mb. trough extending from the western Lakes Region southwestward through the southern Rocky Mountain States, terminating off Lower California (fig. 1B). As this trough connection was made, the east coast trough from Cape Hatteras to Labrador disappeared and heights rose over the southeastern United States. The remainder of the trough retrograded slightly as a result of the wave configuration and vorticity flux from the blocking High. The associated 700-mb. low center moved from western Greenland southwestward to a position just west of Baffin Island (fig. 1B).

With the Polar Low over the Alaskan region replaced by a ridge and blocking system, the northern end of the full-latitude trough in the central Pacific (fig. 1A) disappeared, while the southern end deepened considerably as it moved from near the central Pacific to some 300 miles east of the

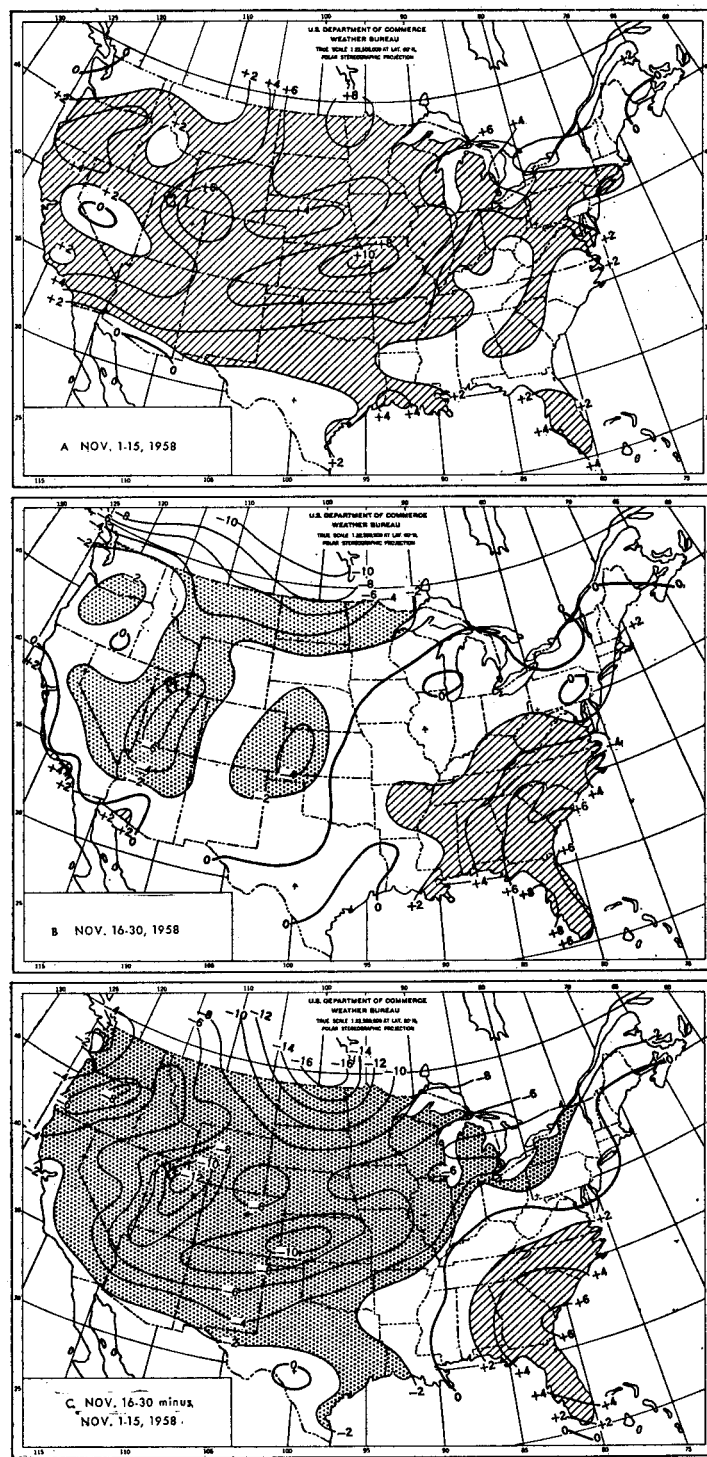


FIGURE 3.—Departure of average temperature from normal (° F.) for (A) November 1-15, 1958, and (B) November 16-30, 1958. (C) Temperature change (° F.), November 16-30 minus November 1-15, 1958. Anomalies greater than $\pm 2^\circ$ F. are shaded. The sharp reversal from a warm regime over most of the country to cold in the West and warm in the East was one of the outstanding features of the month. The intensity of the change is brought into sharp focus by the chart of temperature change between the two halves of the month.

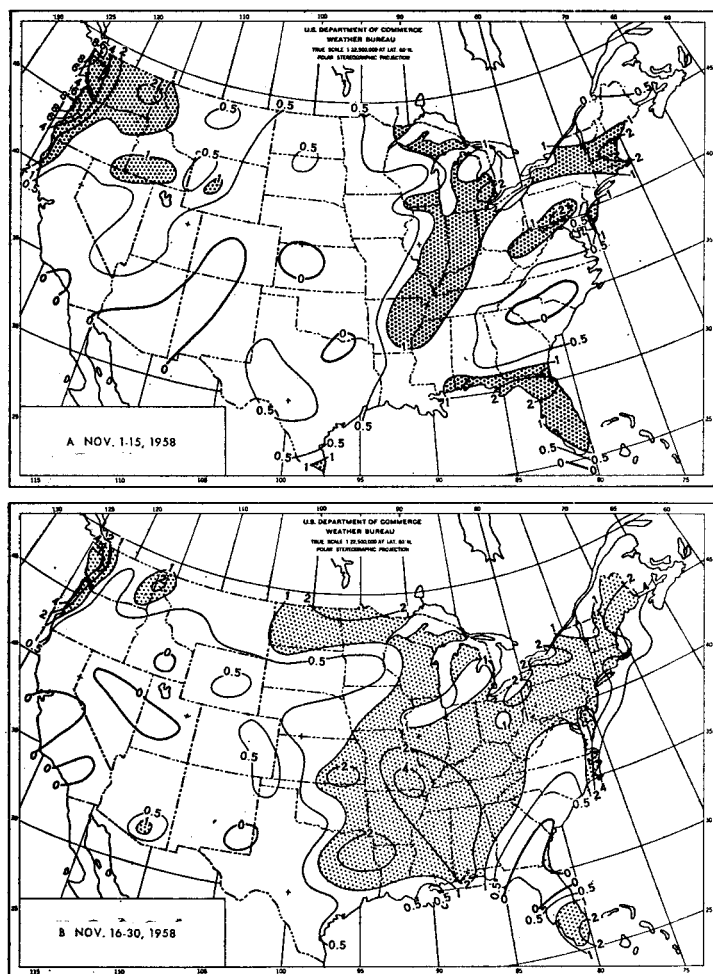


FIGURE 4.—Observed precipitation (approximate) in inches for (A) 1900 EST, October 31, to 1900 EST, November 15, 1958, and (B) 1900 EST, November 15, to 1900 EST, November 30, 1958. Areas greater than 1 inch are shaded. Drying in the West and increased precipitation in the East were characteristic of the month.

Hawaiian Islands. The Asiatic east coast trough remained quasi-stationary from Hokkaido southward, while its northern end sheared off and replaced the northern portion of the ridge which had been in the west-central Pacific.

The eastern Atlantic ridge disappeared as its northern end moved northeastward, establishing a strong block over Denmark with a positive departure from normal of 630 ft. (fig. 1B). The southern end of this ridge retrograded and amalgamated with the western Atlantic High to form one zonally oriented anticyclone extending across the Atlantic. Filling occurred in the Mediterranean trough, but it still remained well defined over the water. The trough that had been located east of the Caspian Sea (fig. 1A) during the first half of the month retrograded and deepened considerably (-570 -ft. anomaly) and joined with the short trough over extreme north-central Asia. This junction formed a strong full-latitude trough from the Caspian Sea north-northeastward to northern Asia (fig. 1B). This flow pattern contrasted with that for the earlier part of the month, particularly in the complete reversal of the anomalous height field in the Ural Mountain area. It is interesting

to observe that a similar circulation reversal occurred during the month of October in the European area [1].

The height change chart (fig. 1C) shows at a glance the magnitude of the circulation reversal which occurred between the two halves of the month. The greatest change occurred from the North Pole ($+330$ ft.) southward to the Pacific (-360 ft.) and from the eastern Atlantic (-450 ft.) eastward through Europe ($+620$ ft.) to western Asia, where a height change of as much as -1010 ft. was observed. While the reversal in the Western Hemisphere was not as intense as in the European area, it was sufficient to effect a marked change in weather over the United States. Though the ultimate cause of such weather reversals is still a matter of conjecture, the interdependence of such changes in various portions of the hemisphere has been often observed.

5. TEMPERATURE AND PRECIPITATION ANOMALIES OF NOVEMBER 16-30

The greatest changes in temperature were cooling over the Plains and Rocky Mountain States and warming over the Southeastern States (fig. 3C). The largest departures from normal were observed over Utah (-6° F.) and western Florida ($+8^{\circ}$ F.) (fig. 3B). The pattern can be related to three major changes in circulation: the new position of the 700-mb. trough over the central portion of the country, a shifting of the field of maximum wind speed at 700 mb., and the increased gradient of anomalous flow. The position of the trough from the western Great Lakes to Arizona aided in advecting warm air into the Southeast. Notice the axis of 700-mb. wind speed maximum from Texas to southeastern New York (fig. 2B). This jet stream was completely lacking during the first half of the month (fig. 2A). It rapidly advected warm air into the Southeast where this warmth became firmly entrenched for the remainder of the month. The filling of the southern portion of the east coast trough, plus the resultant increase of heights ($+50$ to $+140$ ft.), also contributed to the warmth of the Southeast.

At the same time, intensification and retrogression of the ridge in western North America, combined with deepening of the 700-mb. trough over the central United States, brought about an influx of cold Canadian airmasses into the western half of the Nation (Chart IX). Note the development of an area of maximum wind at 700 mb. from west-central Canada into the United States (fig. 2B) and its absence earlier in the month (fig. 2A). It is of interest to observe the northerly anomalous flow (fig. 1B) in the area of cooling, compared with the west to southwest flow that was evident earlier (fig. 1A). Figure 3C shows that the greatest temperature changes occurred in Kansas (-11° F.), North Dakota (-15° F.), and southeastern Georgia ($+6^{\circ}$ F.). Figure 1C also reflects the invasion of colder air into the West with its increased northerly flow of Canadian air.

The precipitation pattern for the last half of the month was characterized by desiccation in the West and generally larger amounts (fig. 4B) in the East. The retrogression

and building of the ridge along the west coast, plus a slight northward shift of the 700-mb. "jet stream," induced a drier 15-day period in the Pacific Northwest and Rocky Mountain States. Pacific coastal stations that had previously reported rainfall amounts of 8 to 9 inches had only 4 to 5 inches during the last 15 days of November, while portions of the Mississippi Valley doubled their precipitation amounts under the influence of increasing southerly flow of moist Gulf air.

6. CHRONOLOGY OF PRINCIPAL STORMS IN NOVEMBER

Violent weather characterized the first few days of November. On the 3d, a vigorous low pressure disturbance swept into the Pacific Northwest, accompanied by damaging winds. As the Low continued through the northern Rocky Mountain States, Northern Plains, and Middle West, it caused widespread wind damage and set records at numerous stations. The wind of 75 m. p. h. recorded at Lander, Wyo., on the 4th was the highest ever recorded there in November and came within 2 m. p. h. of their alltime high. At Olympia, Wash., southerly winds reached 60 m. p. h. with gusts of 76 m. p. h. which overshadowed their previous record of 55 m. p. h. set in December 1945. In the wake of the storm, cold air poured into the North-Central States, producing the coldest weather of the season there.

On November 9 another disturbance with attendant high winds affected the Pacific Northwest and, in succession, the northern Rockies and Great Plains. Exceptionally warm southerly winds accompanied this storm in the central Rockies, where new heat records were established. The Elko, Nev., airport temperature records were toppled on the 8th and 9th. The 74° F. observed on the latter day was the highest temperature ever recorded in November at this station. At Winnemucca, Nev., a new heat record for the day and for so late in the season was established on the 9th when 75° F. was recorded. Copious amounts of precipitation occurred with the low center. The disturbance created near blizzard conditions through mountain passes of Colorado and Montana.

To the south and east of this frontal system, the exceptionally warm southerly flow gave 80° weather on the 10th to eastern Colorado, western Kansas, and the north central border of Nebraska, and warmed the Southeastern States. In the week ending November 17, record and near-record high temperatures spread through much of the central and eastern part of the country. Greatest departures, as much as +18° F., were observed from the south-central Plains northeastward to Illinois. The northward displacement of warmth was aided by a Low in the Rockies and by a strong High over the Southeastern States, creating abnormally strong southerly winds. Alltime heat records for so late in the season were established at numerous cities in Alabama, the Carolinas, Florida, Georgia, Indiana, Illinois, Kentucky, Michigan, Ohio, Pennsylvania, Tennessee, and West Virginia.

The rapid eastward motion of the two storms through the northern Rockies and Plains States was characteristic of the high index circulation observed during their existence. The strong jet stream (fig. 2A) and a weak ridge in the western United States (fig. 1A) effectively steered the storms rapidly through the Northern States.

By far the major feature of this month was the first intense, large snowstorm of the season. The storm center associated with the severe weather developed over Nevada on the 14th. By the 17th, it developed into a classic winter-type storm [8] over western Texas. The principal conditions necessary for such development of an intense storm were all available: an abundant supply of very cold air to the north, an inflow of unusually warm and moist air from the south, plus a favorable upper-air circulation pattern. This storm is discussed in great synoptic detail in an adjoining article by Saylor and Caporaso [9]. The storm deepened rapidly in the mean 700-mb. trough (fig. 1B) as it moved in a northerly direction through the Great Plains, generally following the 700-mb. trough before passing into extreme southwestern Ontario on the 18th.

Fourteen States were affected by this vigorous storm. The disturbance spread record-breaking snows into Arizona, New Mexico, the Great Plains, and as far north as Montana. The cold Arctic air poised over southwestern Canada swept into the Southwestern States, bringing bitter cold temperatures and new records for so early in the season in California, Arizona, and Nevada; for example, Flagstaff, Ariz., -13° F. on the 18th; Ely, Nev., -10° F. on the 16th; Santa Maria, Calif., 25° F. on the 17th. An interesting item is quoted from the *Local Climatological Data* for Tucson, Ariz. "Since 1895, snow has been recorded only once before in November [1919], and the total for that occurrence was only a trace. In addition, the 24-hour total of 6.4 inches of snow [on the 16th] was the greatest recorded for that period for any month since 1895."

Strong winds accompanied the storm and caused extensive drifting and blowing of snow. Many areas from Texas northward to the Canadian border reported extensive property damage. Many tornadoes occurred in the center of the Nation. Peak wind gusts of 104 m. p. h. were reported at Childress, Tex., as the cold air swept into that State. Winds clocked at 60 m. p. h. in Minneapolis, Minn., on the 17th broke their alltime record of 47 m. p. h. recorded back in 1913. The storm was climaxed with a loss of 33 lives as the freighter *Carl D. Bradley* broke up in a gale in northern Lake Michigan on November 18.

The month of November faded into the past with a snow and ice storm lasting from the 27th through the 30th. The low-pressure disturbance spread glaze and snow in a wide belt from the Central and Southern Plains to New England. The storm first developed over the central Rockies and moved into west Texas on the 28th where it filled. At the same time, a new low center developed over the western Gulf of Mexico and deepened as it

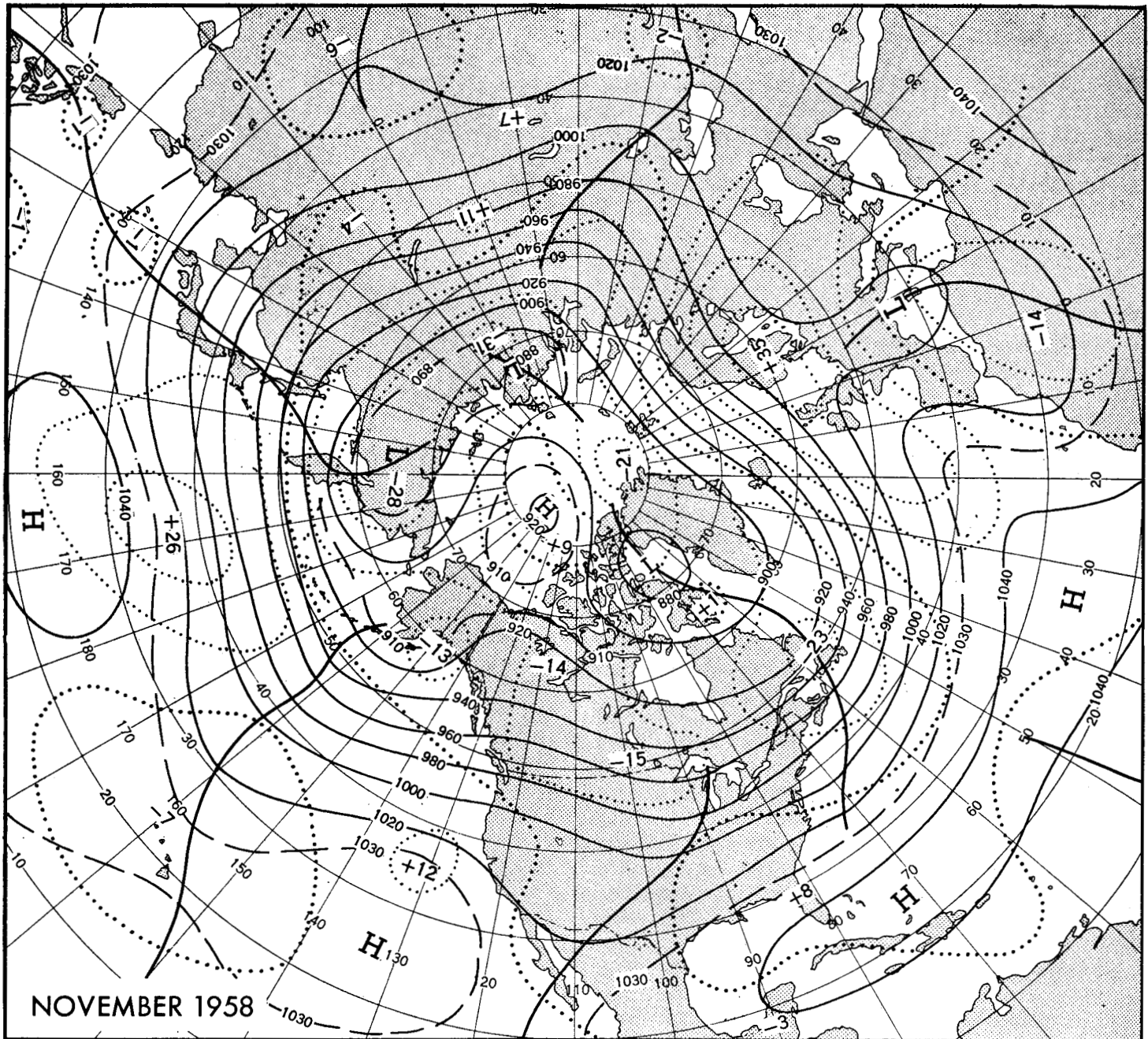


FIGURE 5.—Mean 700-mb. height contours (solid lines) and departures from normal (dotted lines) (both in tens of feet) for November 1958. Major circulation features over North America were trough-ridge systems of minor amplitude, characteristic of high-index circulation, with relatively small departures from normal over the United States. The intense polar Low of October filled and was replaced by a blocking High. The ridge over eastern Europe continued to build, resulting in a departure from normal of +350 ft.

rapidly moved northeastward, following the jet stream (fig. 2B) at 700 mb. to the central Appalachians, across New England, over the Gulf of St. Lawrence, and northward into the Labrador Sea on the 30th, where it subsequently filled and disappeared. As the storm swept northeastward, it was accompanied by gale force winds, especially over southeastern New England, where peak gusts of 60–70 m. p. h. caused property damage. The storm caused heavy snow north of its center, with accumulations up to nearly 3 feet in western New York State and up to a foot in northwestern Pennsylvania and north-

eastern Ohio. At Evansville, Ind., the 6.9 inches of snow exceeded any previous November daily total snowfall in 62 years. At Oklahoma City, 24-hour snowfall of 2.6 inches on November 27–28 was the greatest 24-hour amount in 69 years of record for the month of November. The storm caused widespread hazardous highway conditions during the Thanksgiving holiday season.

Intense cold accompanied by strong northerly winds blew across the Great Plains, Central States, and eastern portions of the country. New record low temperatures were established in parts of Ohio, western Pennsylvania,

and Indiana on the 29th and 30th. This November made its exodus with extremely cold air gripping most of the Nation from the Great Plains eastward.

7. MONTHLY SUMMARY OF CIRCULATION AND WEATHER ANOMALIES

Because of the changing regime, the mean monthly 700-mb. chart for November (fig. 5) did not display any outstanding features or large departures from normal. However, as one might expect, the monthly mean chart exhibited many of the major features present on the half-monthly mean charts (fig. 1). The North American east coast trough which was evident during the first half of the period was still observed on the monthly mean, in spite of the slight ridging that occurred during the latter part of the month over the Southeastern States. The trough in the central United States which intensified, retrograded, and combined with the southwest trough during the second half of the month, is also observed on the monthly mean. The full-latitude trough in the central Pacific, which was quite prominent during the early part of November, was destroyed at its northern end during the latter part of the month, and was therefore reflected as only a mid-latitude trough on the monthly mean.

The ridge remained along the coast of western North America with building heights toward the pole. This area reflected the greatest change between October and November as a rise of 460 ft. occurred north of Alaska (fig. 6) where the polar vortex was replaced by a blocking High. The resultant Ω -type circulation at high latitudes was associated with two other major changes. One occurred over Siberia with a fall of 340 ft. as lower heights replaced the weak ridge that existed in October. The second was a height change of -330 ft. (fig. 6) north of Hudson Bay as a Low developed over Baffin Bay in the eastern leg of the Ω -type block system. Other important changes took place in the central Pacific as the strong ridge of October, evidenced by a departure from normal of +360 ft. [1], gave way to trough conditions, resulting in a fall of 260 ft.

General ridging took place in Europe, evidenced by height rises of 310 ft. over central Europe and 260 ft. off Scotland. Even though a bimonthly change of large magnitude took place over most of the European continent, the block that developed over Denmark during the latter half of the month was reflected on the monthly mean by a height anomaly of +350 ft. (fig. 5). The central Eurasian trough, which only became well established during the second half of the period, was observed as sheared off from the low cell in extreme north-central Asia in almost the same fashion as in the first part of the month (figs. 1, 5).

Of interest is the fact that the zonal index, a measure of the net geostrophic west wind flow from 35° to 55° N. in the Western Hemisphere, was 1.0 m. p. s. faster than normal in November, making this the seventh consecutive month of above normal index. This extended period of

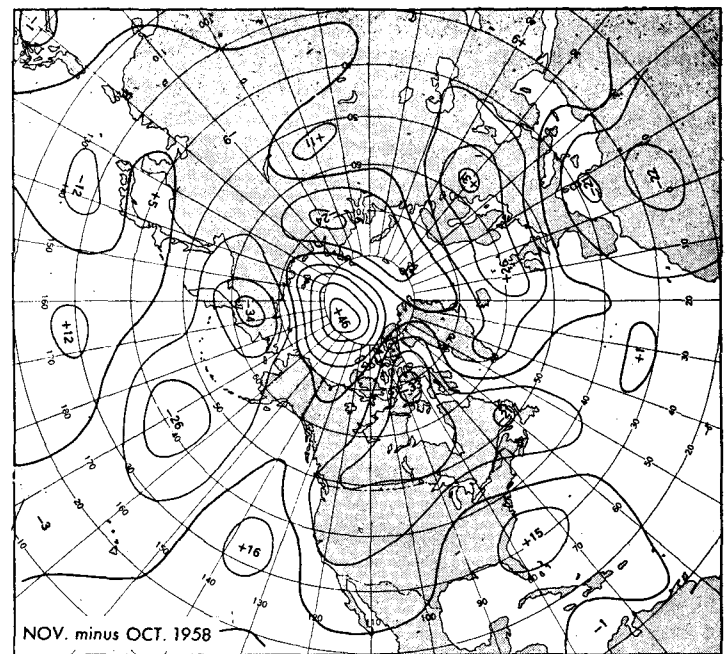


FIGURE 6.—Difference between the monthly mean 700-mb. height departures from normal of October and November 1958 (in tens of feet). The largest change occurred near the pole (+460 ft.), incident to the filling of the polar vortex and its replacement by a blocking High. Relaxation of blocking over Canada was reflected by a change of -330 ft. north of Hudson Bay.

fast westerlies was temporarily interrupted during the latter half of October but resumed in November.

Small temperature anomalies (Chart I-B) were observed over the United States, with almost the entire Nation averaging above normal. Positive temperature anomalies are typical of the high index circulation that existed during November. The anomalies were small, not only because of the temperature reversal that occurred during the month, but also due to rather weak, ill-defined anomalous flow associated with near normal heights over the United States. The small negative anomalies in the extreme northern Rocky Mountain States were associated with some weak northerly anomalous flow.

While the monthly averages lacked large extremes, many daily temperature records were broken in the western part of the country in the establishment of new highs during the first half of the month, followed by record lows during the latter part of the month. The development of a southwest jet during the latter part of the month advected warm air masses into the southern and eastern United States, where many longstanding heat records were toppled.

The abnormally warm weather which had persisted for the past several months in California [1, 2] abated somewhat in November as a result of an invasion of very cold Canadian air that occurred in connection with an intense storm in the Rocky Mountain and Great Plains States from November 14-16. In spite of the general cooling, Los Angeles International Airport continued to report much above normal temperatures [7], making November

the 21st consecutive month in this category and continuing the uninterrupted warmer than normal regime which commenced in May of 1956. This was also the second warmest November on record at the airport station. The city office continued to show similar warmth, but not as marked as the airport. In San Diego, November was the eighth consecutive month with above-normal temperatures, even though record low temperatures were established on the 16th and 17th with readings of 42° F. and 41° F., respectively. Ballenzweig [2] has discussed in some detail the influence of above normal sea surface temperatures for waters along the coast. This effect can be seen by examining the anomalous flow for the different halves of November (fig. 1). Note in particular the well-marked, onshore anomalous flow during the first half of the month, as compared to the generally offshore flow for the latter half. The lessening influence of the water temperatures and subsequent cooling associated with the changes in flow are also illustrated by the temperature change chart (fig. 3C), which shows cooling extending to the coastal stations.

Precipitation was relatively well distributed over most of the United States except for the southern Carolinas and central California, where less than one-half of the normal precipitation was observed, and the extreme northern Rocky Mountain and Plains States, where over twice the normal precipitation fell (Chart III-B). The precipitation pattern was the result of a scattering of storm tracks during the month (Chart X). The first part of the month was characterized by several east coast storms, followed by an absence of any such disturbances during the last half of the month. The Pacific Northwest and northern tier of States was an area of storminess accompanied by moderate to heavy rain as storms from the Pacific and Canada traveled through that area (Chart X). This was the wettest November ever recorded in Stampede Pass, Wash., and the second wettest November on record at Havre, Mont. During the latter part of the month the storm track shifted to the Plains States, Mississippi and Ohio Valleys, and the northeastern United States as a result of filling of the lower portion of the east coast trough in response to the retrogression and deepening of the central United States trough as it joined with the trough over the Southwest.

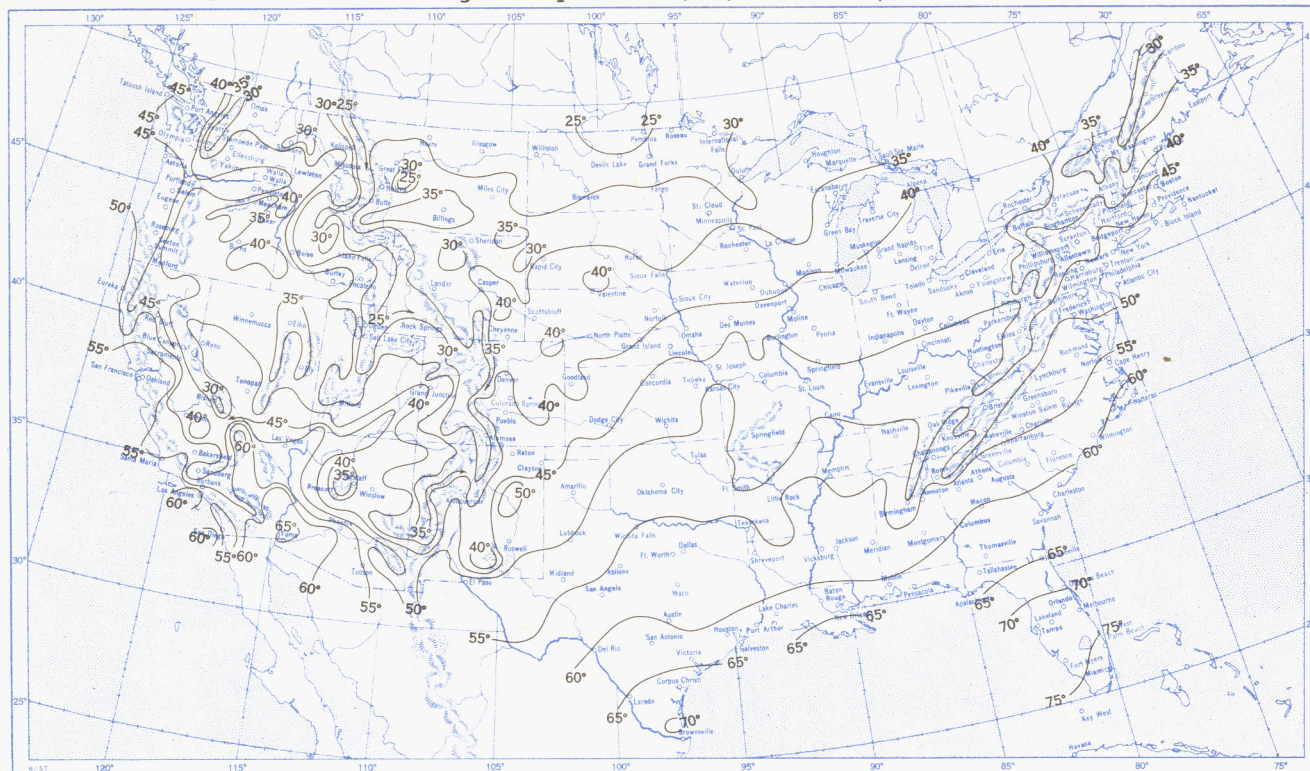
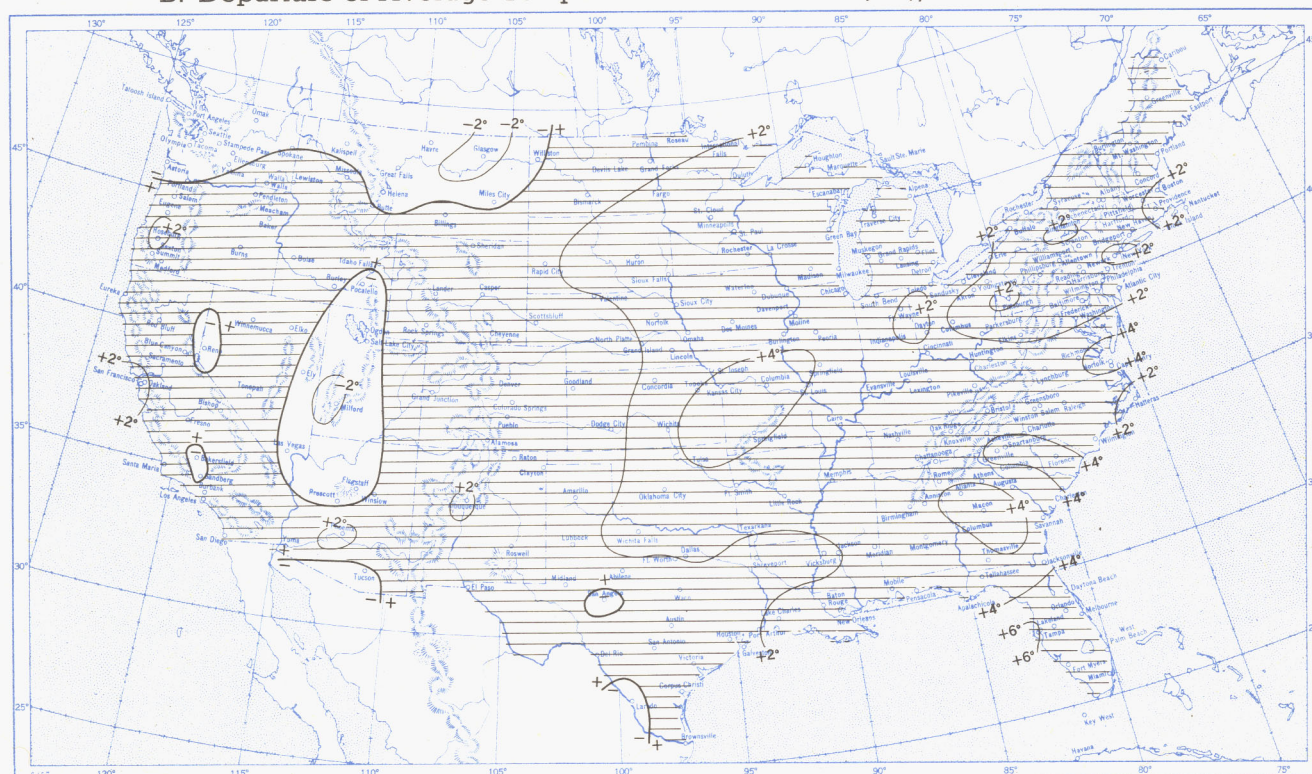
November may be summed up as a month of storminess, rapid changes in temperature, and early cold over the West and late warmth in the Southeast.

8. TROPICAL STORM ACTIVITY

No tropical storm activity was observed in the North Atlantic during the month, where on the average two storms are expected to develop every 5 years [3]. However, in the Pacific considerable tropical activity occurred; 5 storms were observed within the month, 3 of which developed during November. Activity was considerably above normal in this area for so late in the season [5]. Two of the three storms developed into typhoons, both of which recurved and became extratropical. The third tropical storm never attained typhoon proportions and did not move more than 6° of latitude from its birthplace during its life cycle. None of the tropical storms affected land areas.

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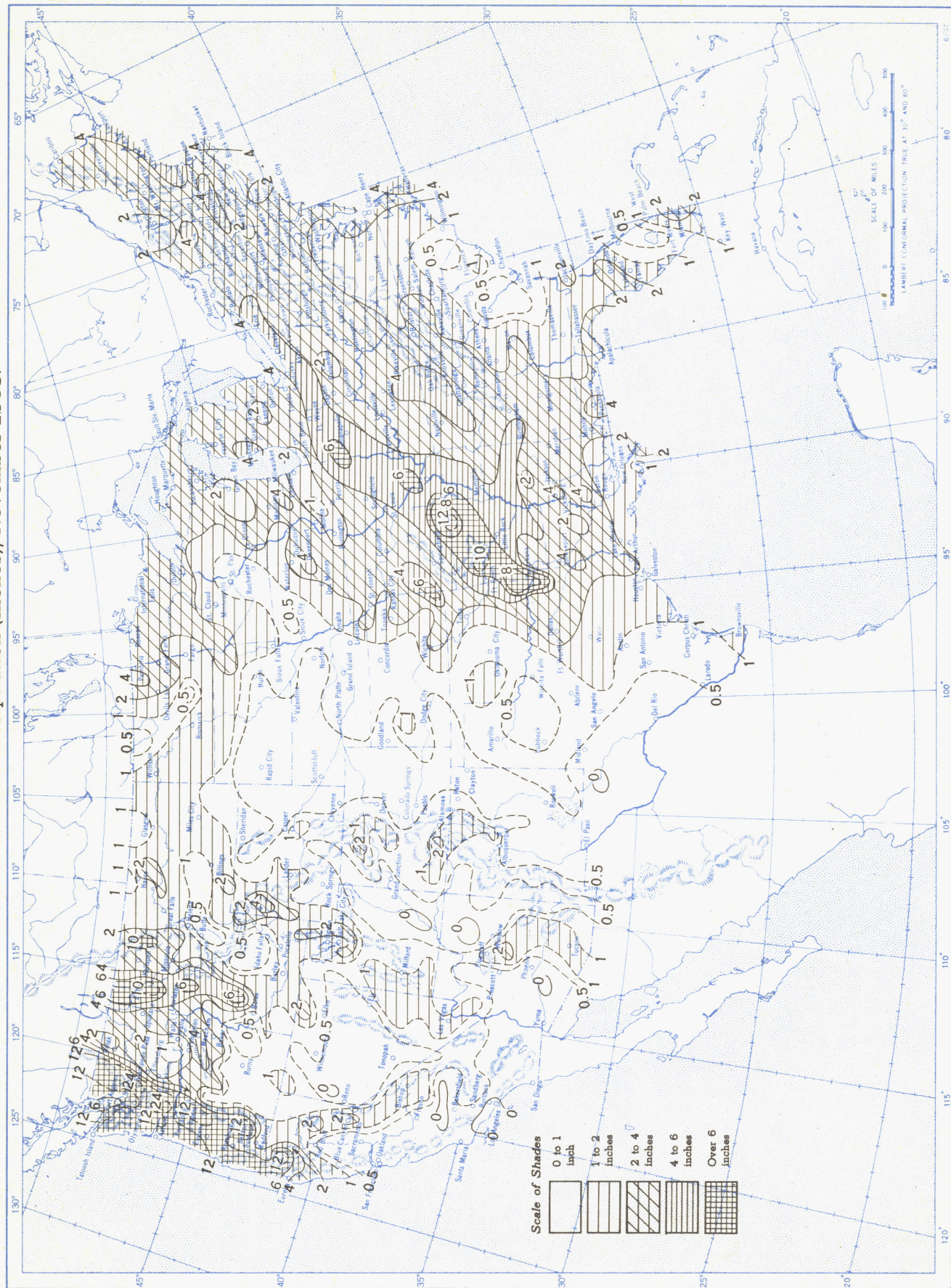
Chart I. A. Average Temperature ($^{\circ}\text{F.}$) at Surface, November 1958.B. Departure of Average Temperature from Normal ($^{\circ}\text{F.}$), November 1958.

A. Based on reports from over 900 Weather Bureau and cooperative stations. The monthly average is half the sum of the monthly average maximum and monthly average minimum, which are the average of the daily maxima and daily minima, respectively.

B. Departures from normal are based on the 30-yr. normals (1921-50) for Weather Bureau stations and on means of 25 years or more (mostly 1931-55) for cooperative stations.

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Chart II. Total Precipitation (Inches), November 1958.

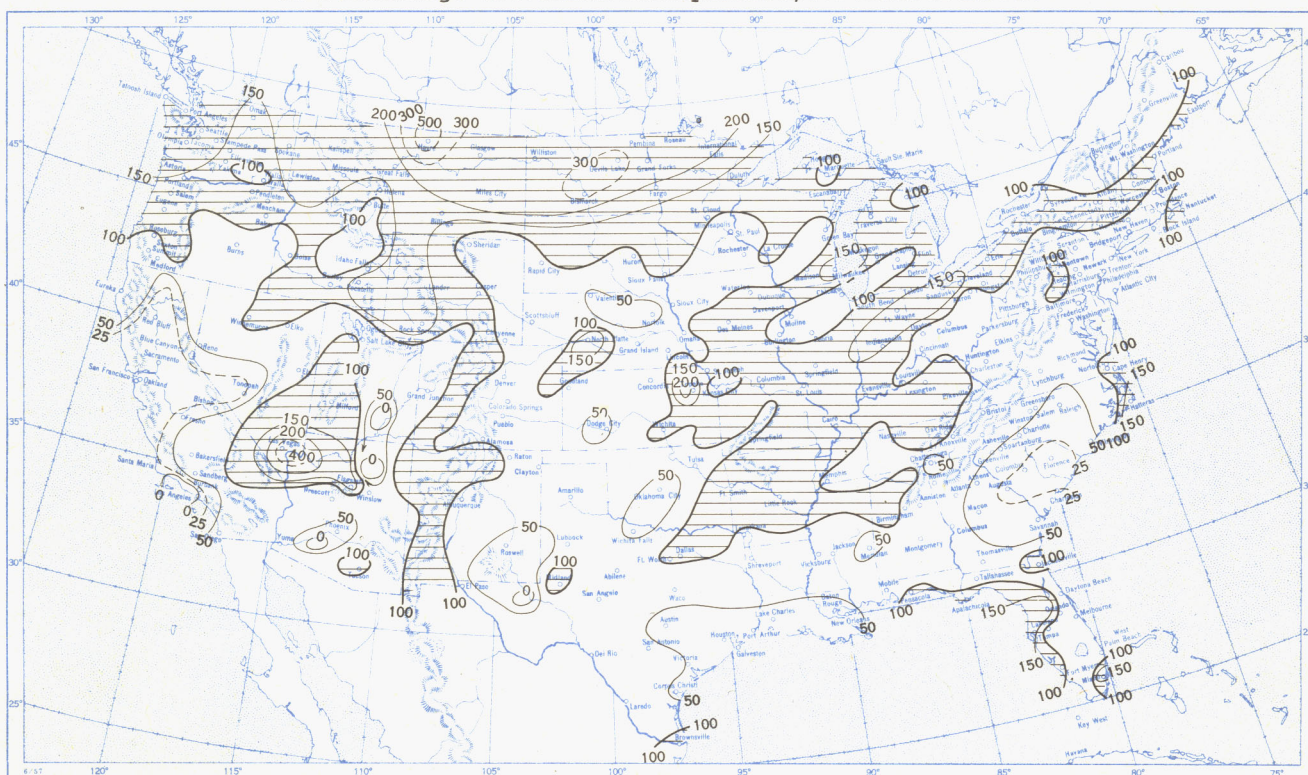


Based on daily precipitation records at about 800 Weather Bureau and cooperative stations.

Chart III. A. Departure of Precipitation from Normal (Inches), November 1958.

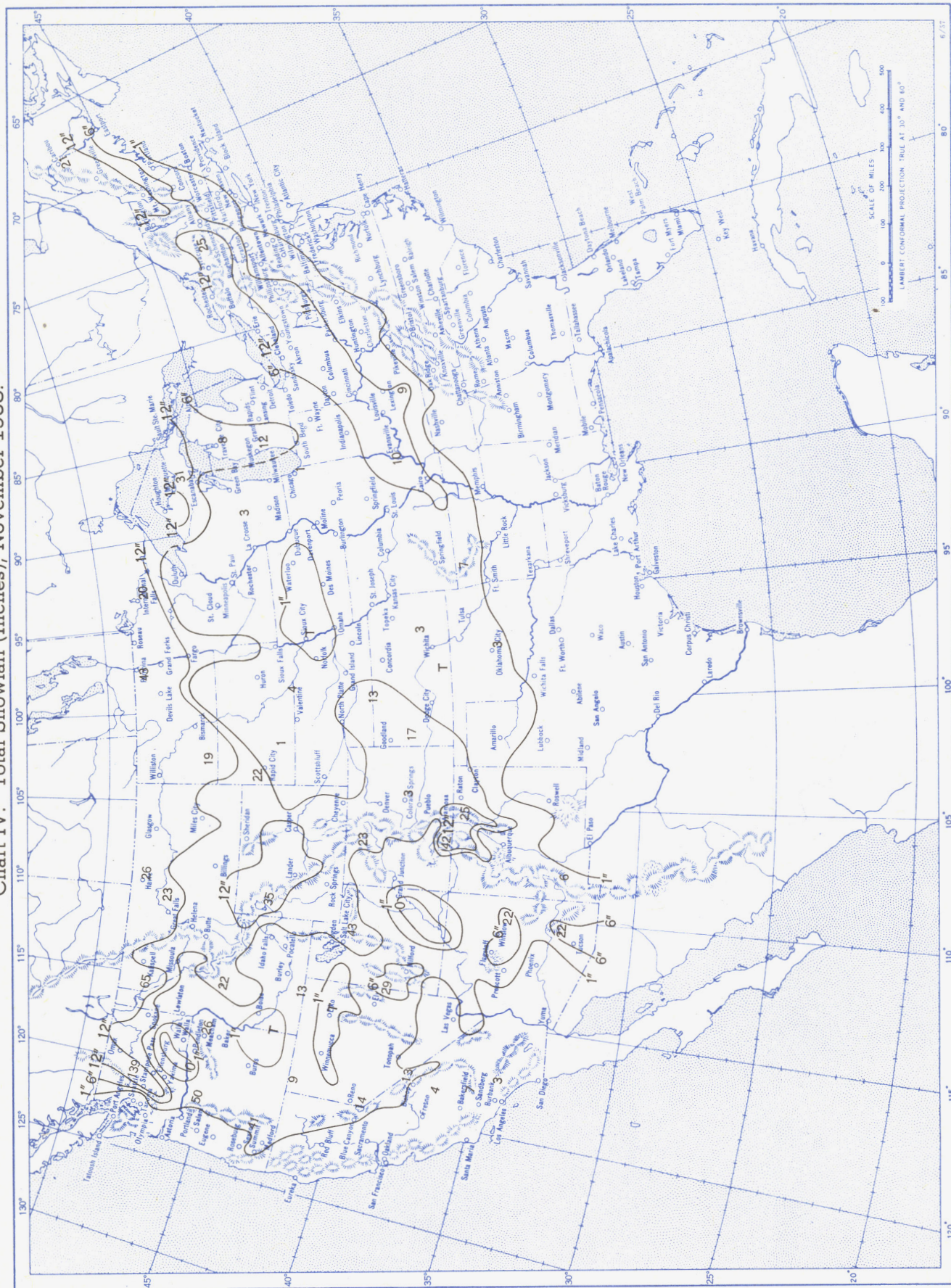


B. Percentage of Normal Precipitation, November 1958.



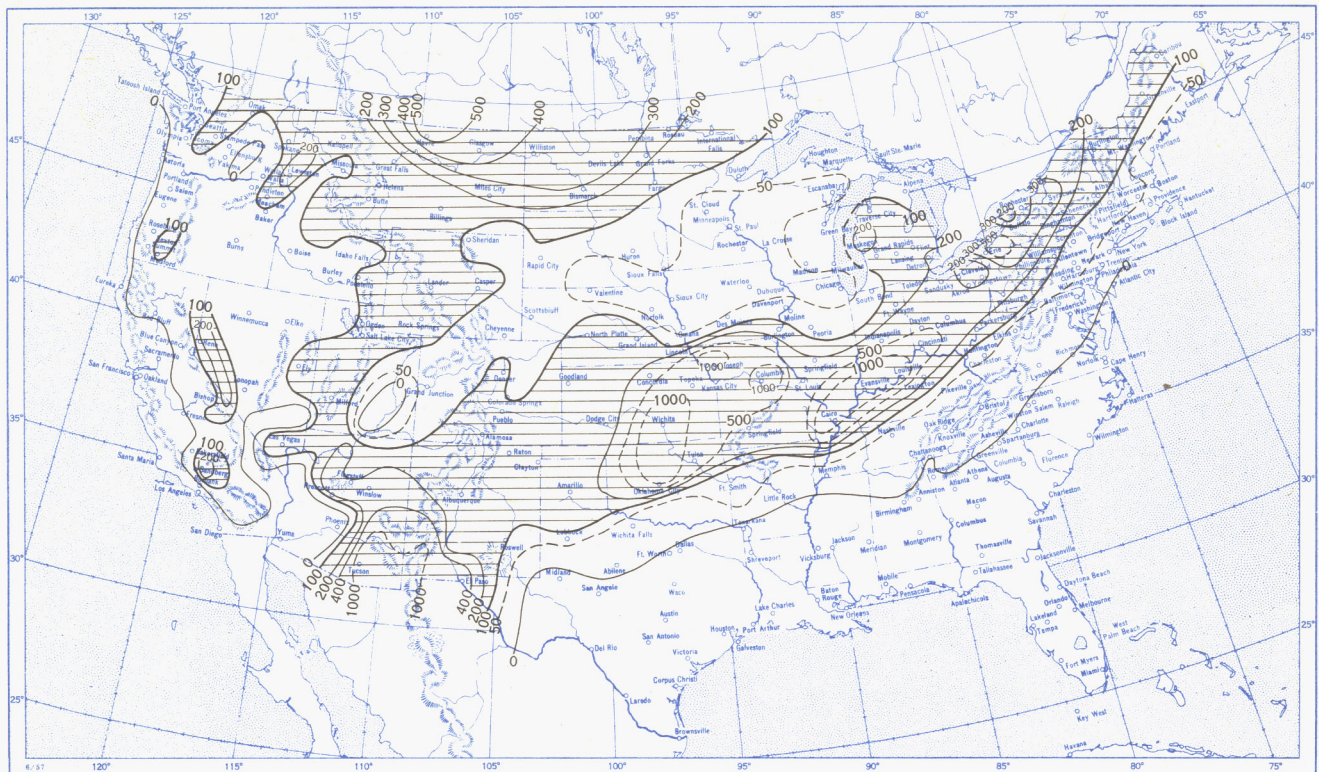
Normal monthly precipitation amounts are computed from the records for 1921-50 for Weather Bureau stations and from records of 25 years or more (mostly 1931-55) for cooperative stations.

Chart IV. Total Snowfall (Inches), November 1958.

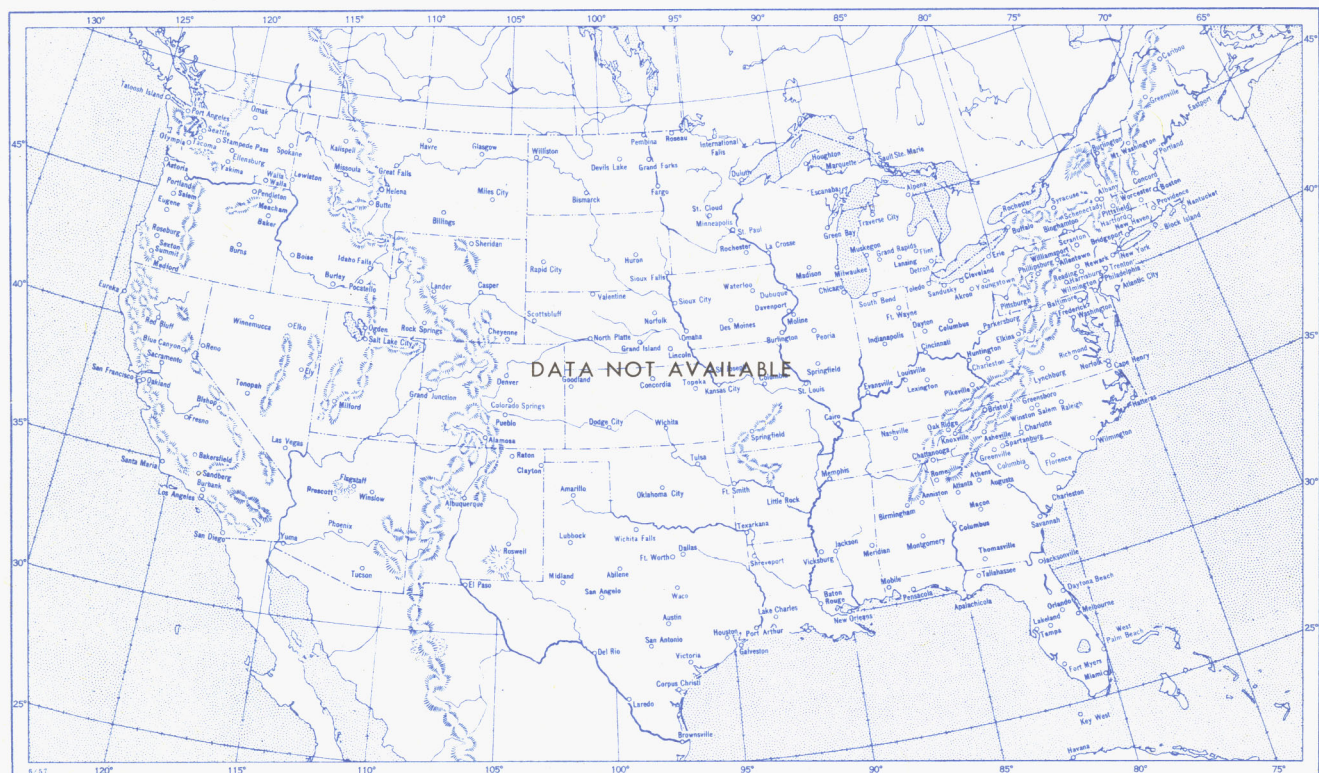


This is the total of unmelted snowfall recorded during the month at Weather Bureau and cooperative stations. This chart and Chart V are published only for the months of November through April although of course there is some snow at higher elevations, particularly in the far West, earlier and later in the year.

Chart V. A. Percentage of Normal Snowfall, November 1958.



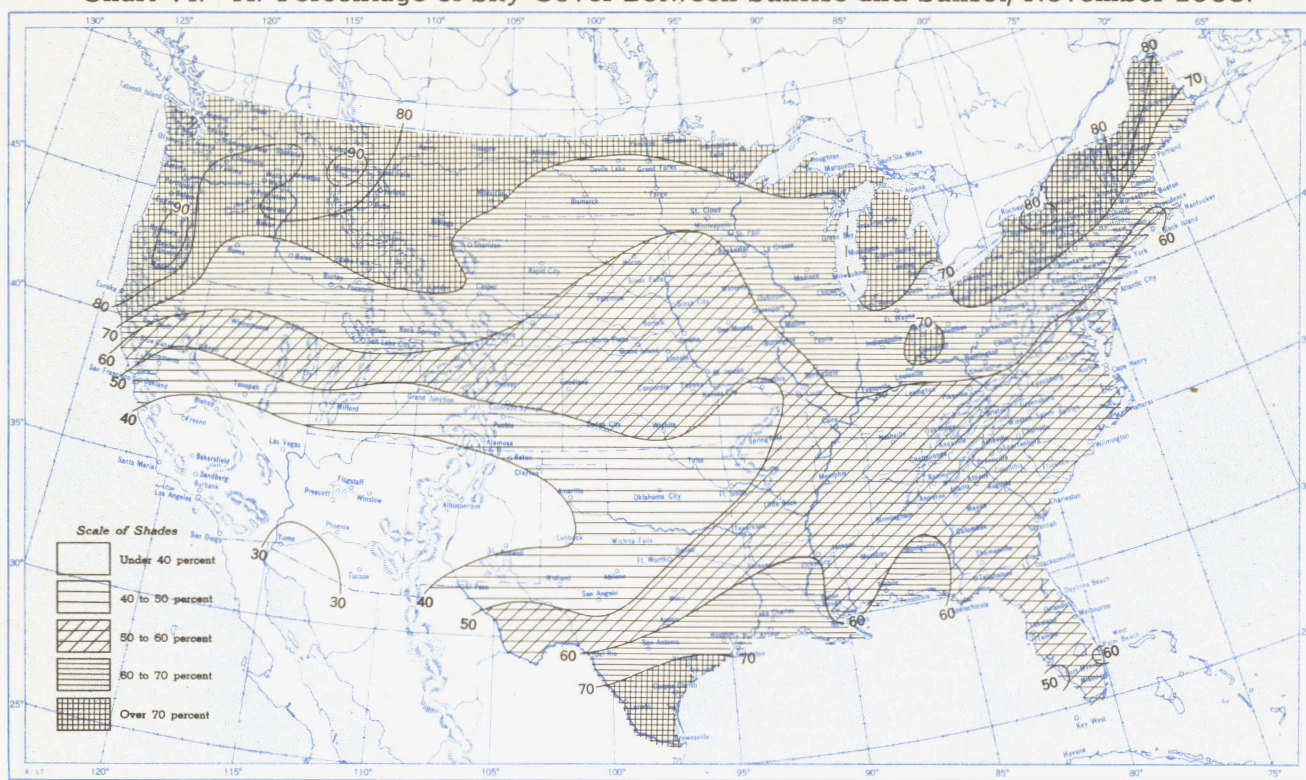
B. Depth of Snow on Ground (Inches), 7:00 a. m. E. S. T., November 24, 1958.



A. Amount of normal monthly snowfall is computed for Weather Bureau stations having at least 10 years of record.
 B. Shows depth currently on ground at 7:00 a. m. E. S. T., of the Monday nearest the end of the month. It is based on reports from Weather Bureau and cooperative stations. Dashed line shows greatest southern extent of snowcover during month.

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Chart VI. A. Percentage of Sky Cover Between Sunrise and Sunset, November 1958.



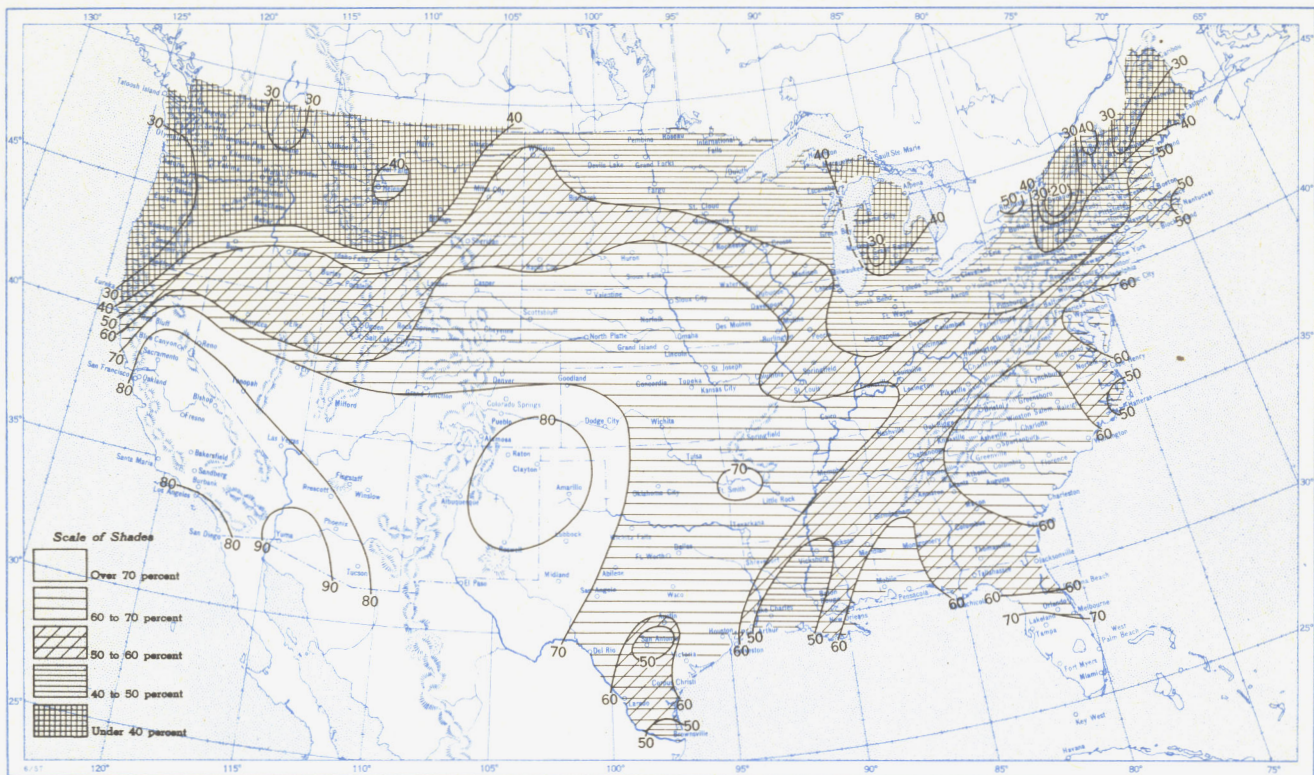
B. Percentage of Normal Sky Cover Between Sunrise and Sunset, November 1958.



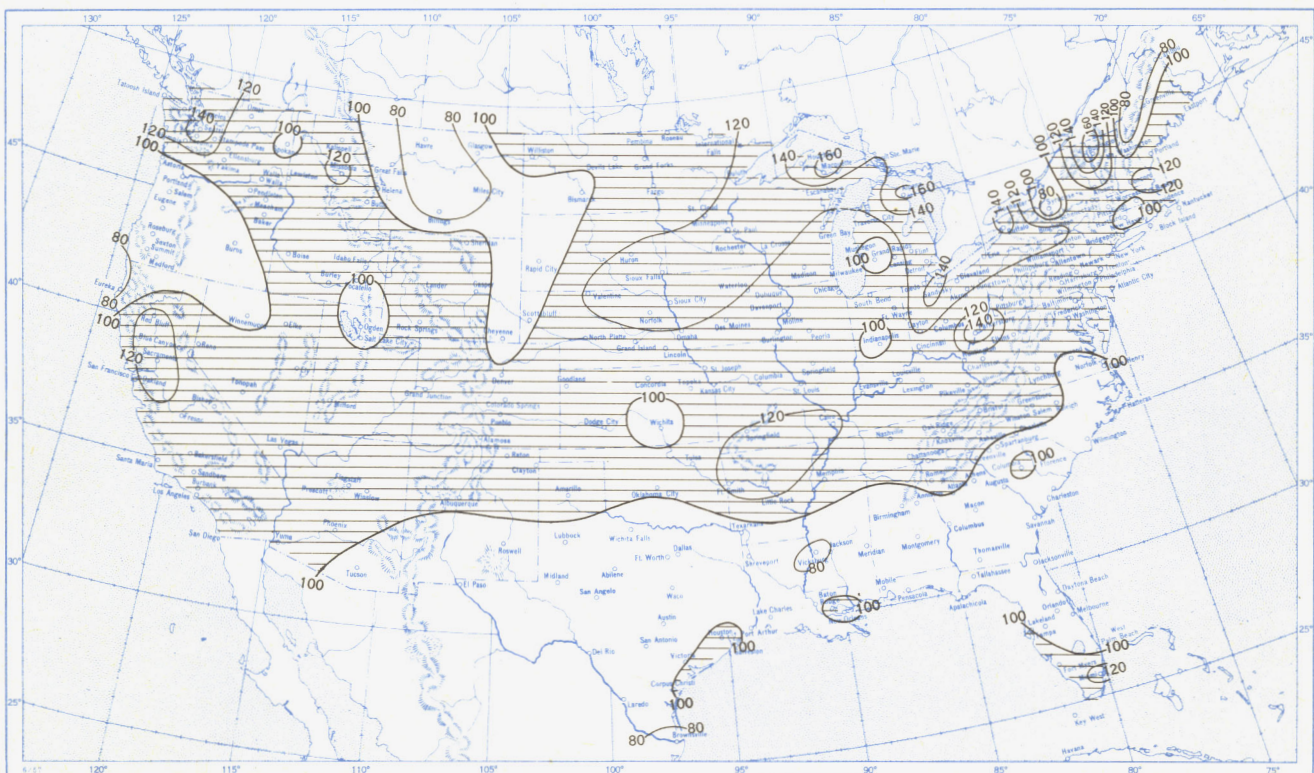
A. In addition to cloudiness, sky cover includes obscuration of the sky by fog, smoke, snow, etc. Chart based on visual observations made hourly at Weather Bureau stations and averaged over the month. B. Computations of normal amount of sky cover are made for stations having at least 10 years of record.

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Chart VII. A. Percentage of Possible Sunshine, November 1958.



B. Percentage of Normal Sunshine, November 1958.



A. Computed from total number of hours of observed sunshine in relation to total number of possible hours of sunshine during month. B. Normals are computed for stations having at least 10 years of record.

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Chart VIII. Average Daily Values of Solar Radiation, Direct + Diffuse, November 1958. Inset: Percentage of Mean Daily Solar Radiation, November 1958. (Mean based on period 1951-55.)

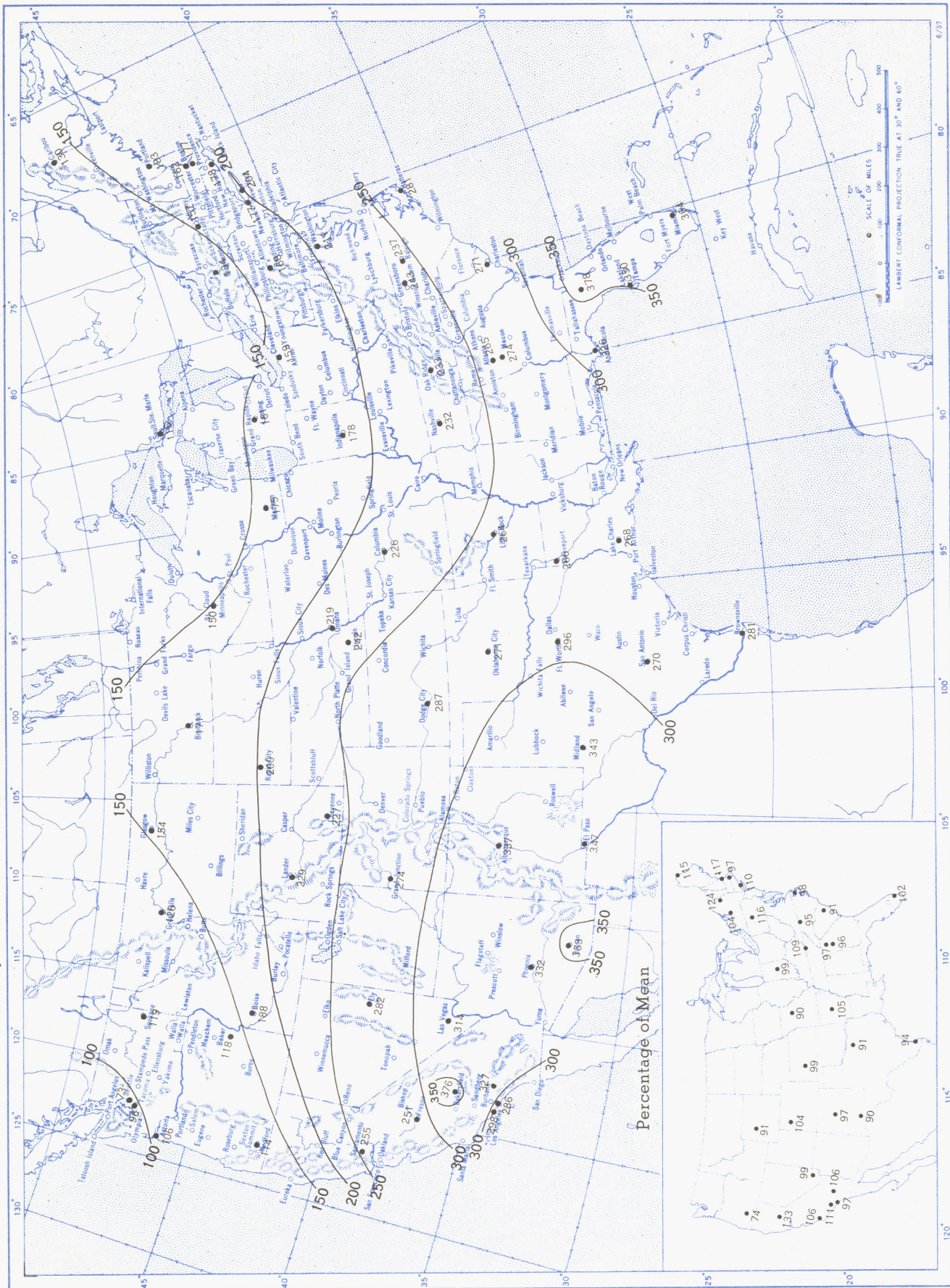
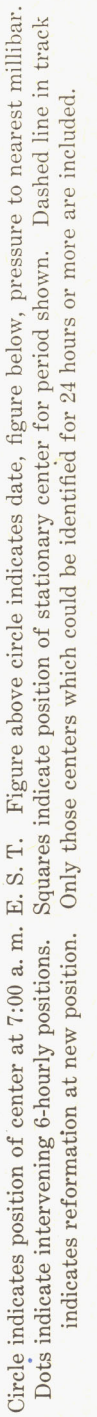
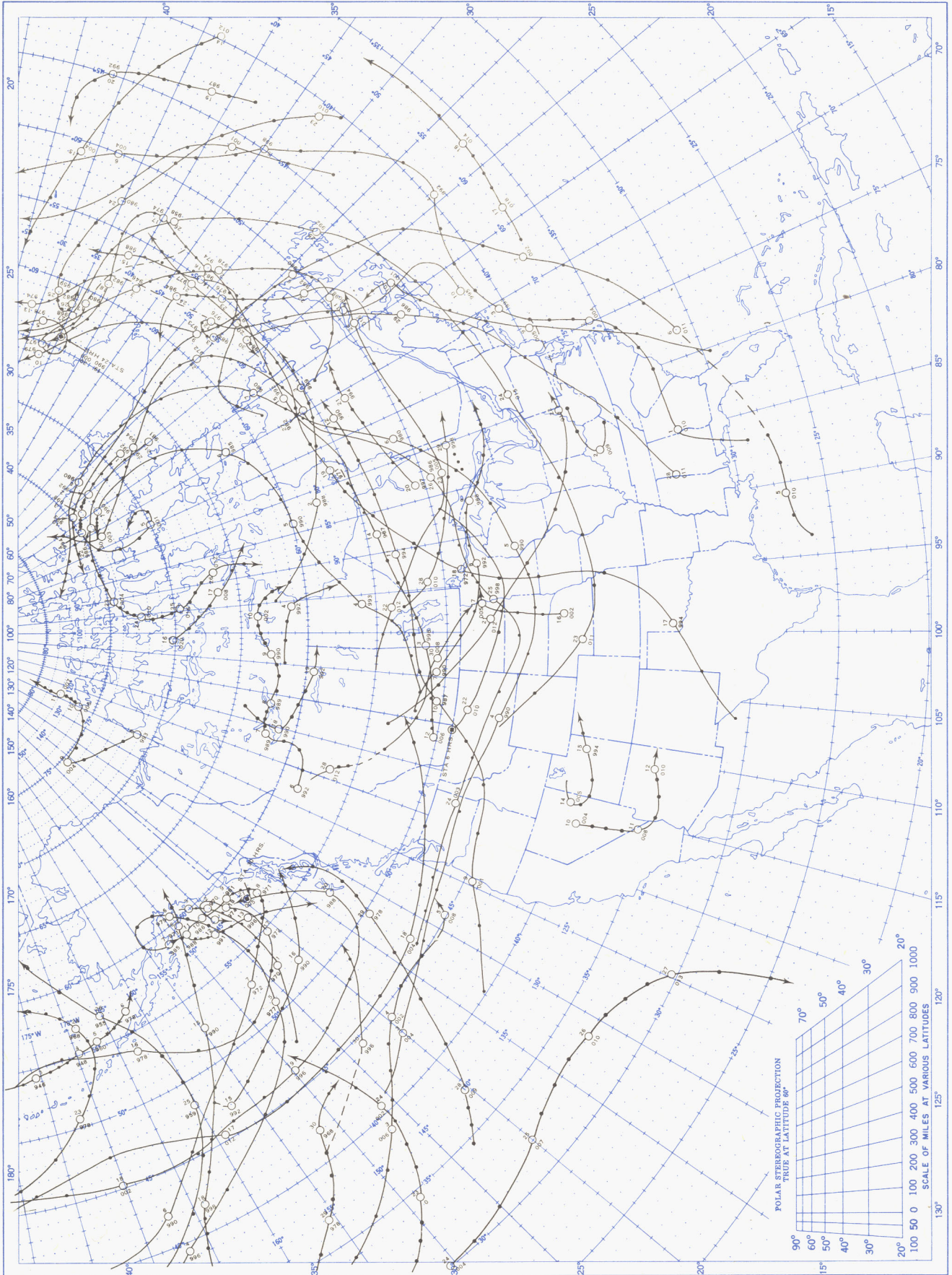


Chart shows mean daily solar radiation, direct + diffuse, received on a horizontal surface in langley's (1 langley = 1 gm. cal. cm. $^{-2}$). Basic data for isolines are shown on chart. Further estimates are obtained from supplementary data for which limits of accuracy are wider than for those data shown. The inset shows the percentage of the mean based on the period 1951-55.



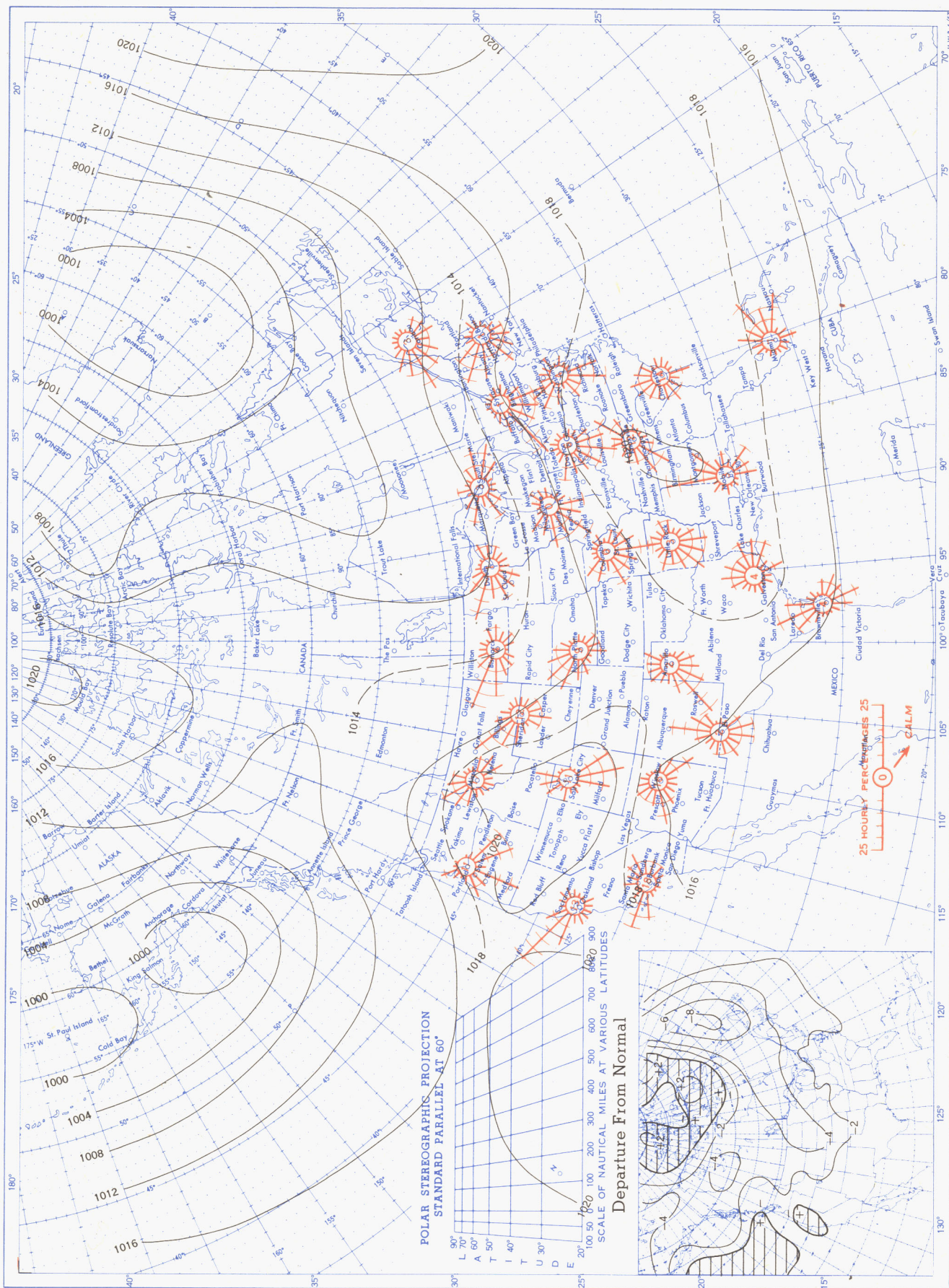
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Chart X. Tracks of Centers of Cyclones at Sea Level, November 1958.



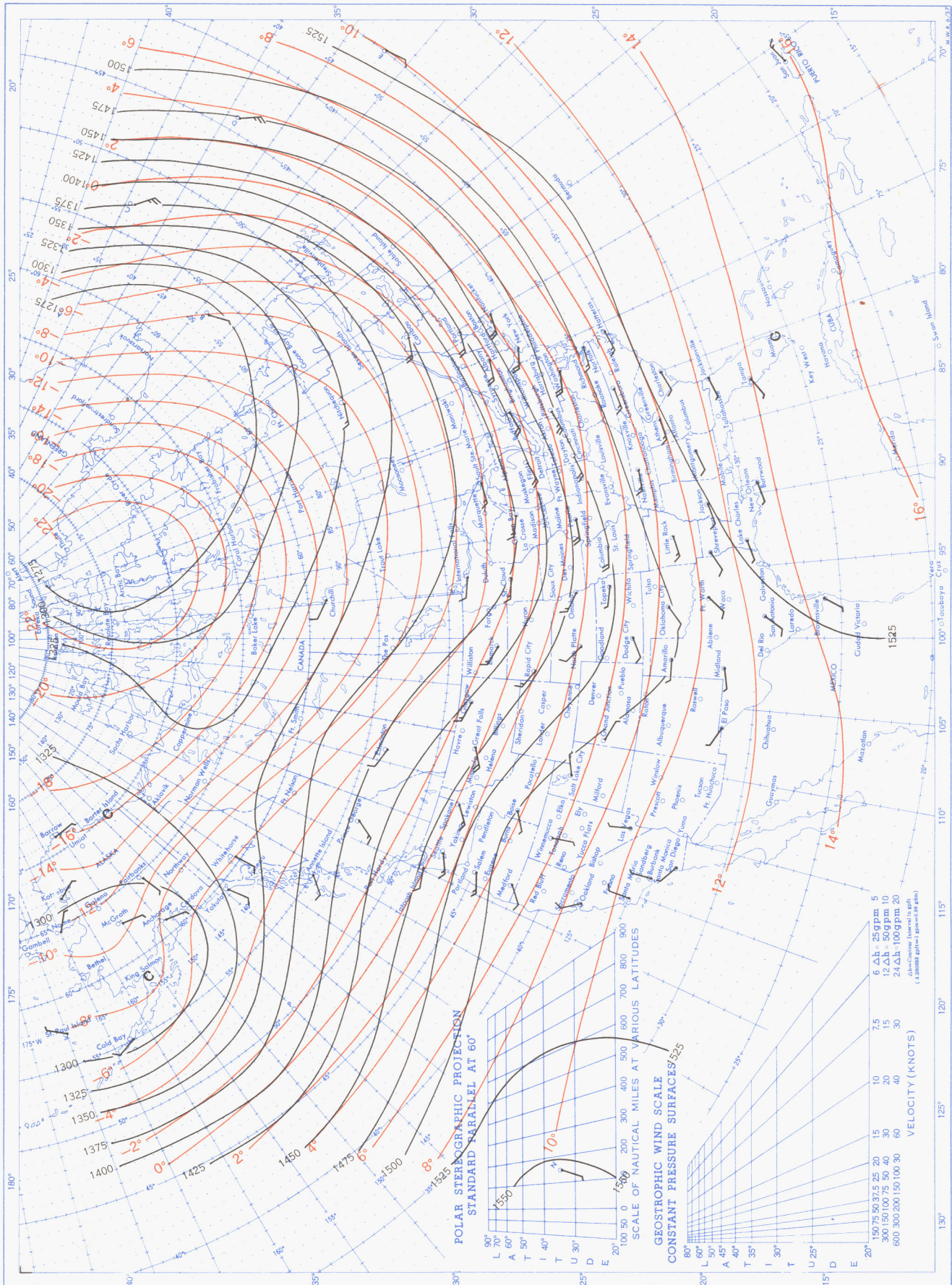
Circle indicates position of center at 7:00 a. m. E. S. T. See Chart IX for explanation of symbols.

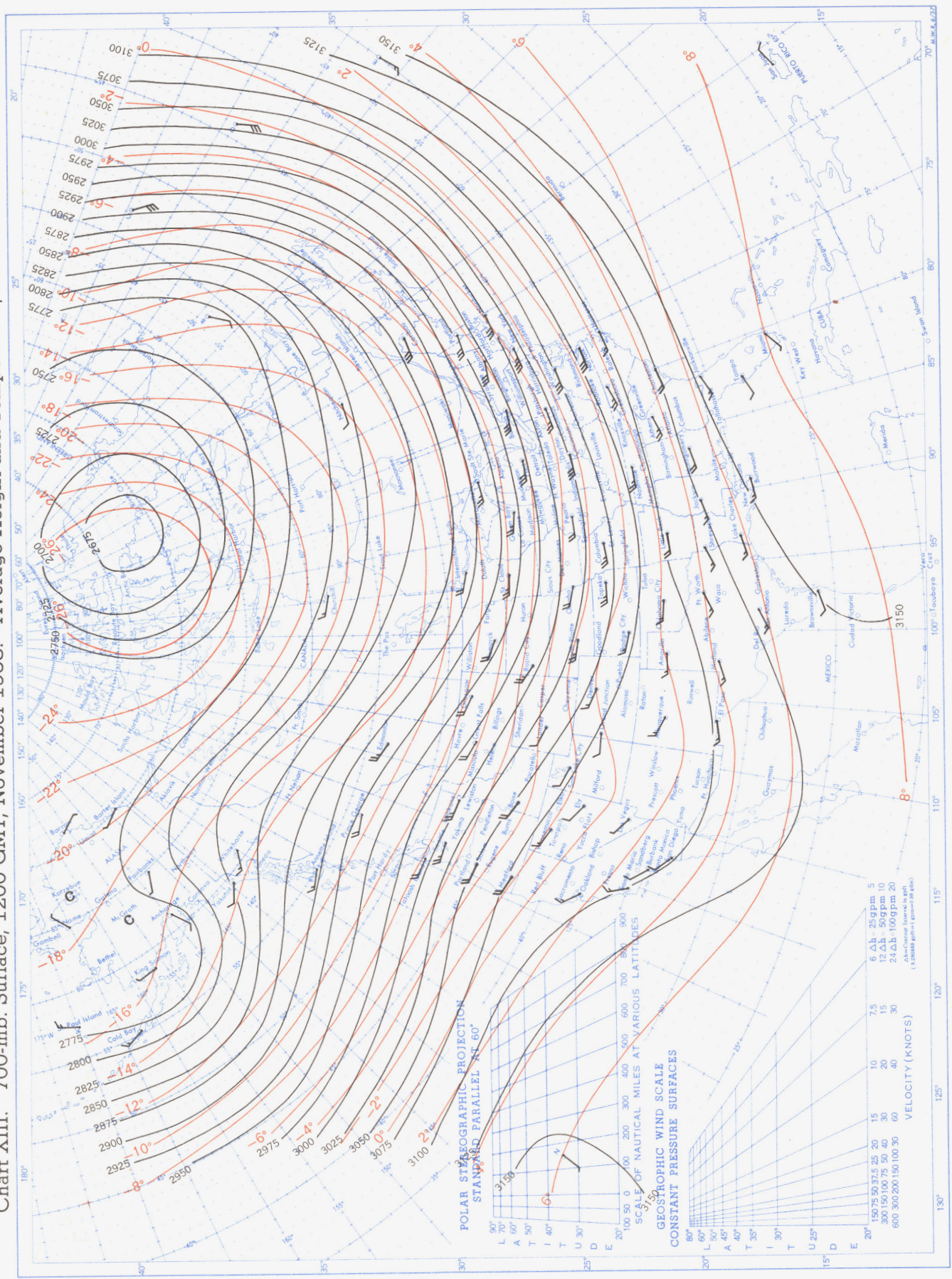
Chart XI. Average Sea Level Pressure (mb.) and Surface Windroses, November 1958. Inset: Departure of Average Pressure (mb.) from Normal, November 1958.



Average sea level pressures are obtained from the averages of the 7:00 a. m. and 7:00 p. m. E. S. T. readings. Windroses show percentage of time wind blew from 16 compass points or was calm during the month. Pressure normals are computed for stations having at least 10 years of record and for 10° inter-sections in a diamond grid based on readings from the Historical Weather Maps (1899-1939) for the 20 years of most complete data coverage prior to 1940.

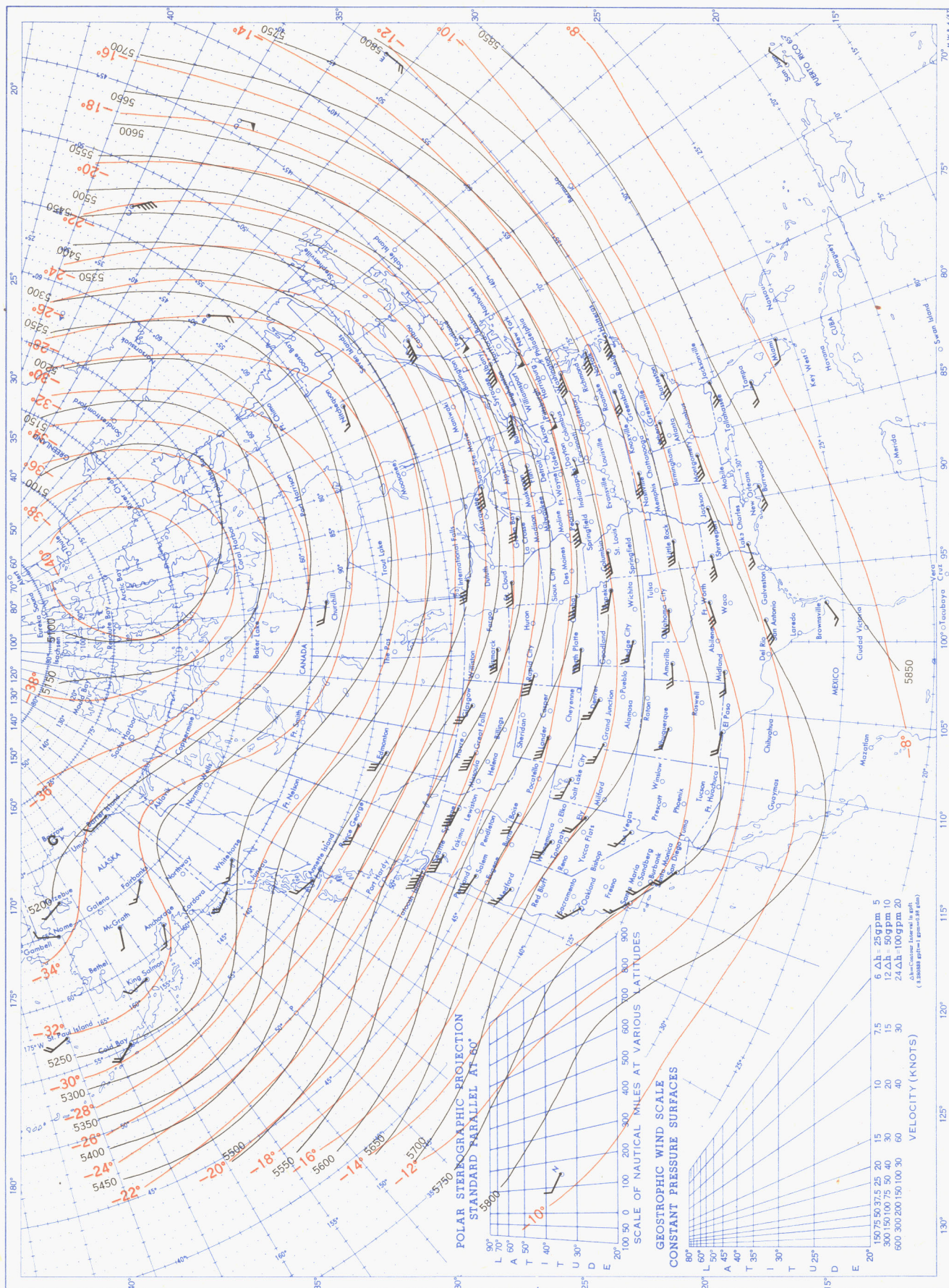
Chart XII. 850-mb. Surface, 1200 GMT, November 1958. Average Height and Temperature, and Resultant Winds.





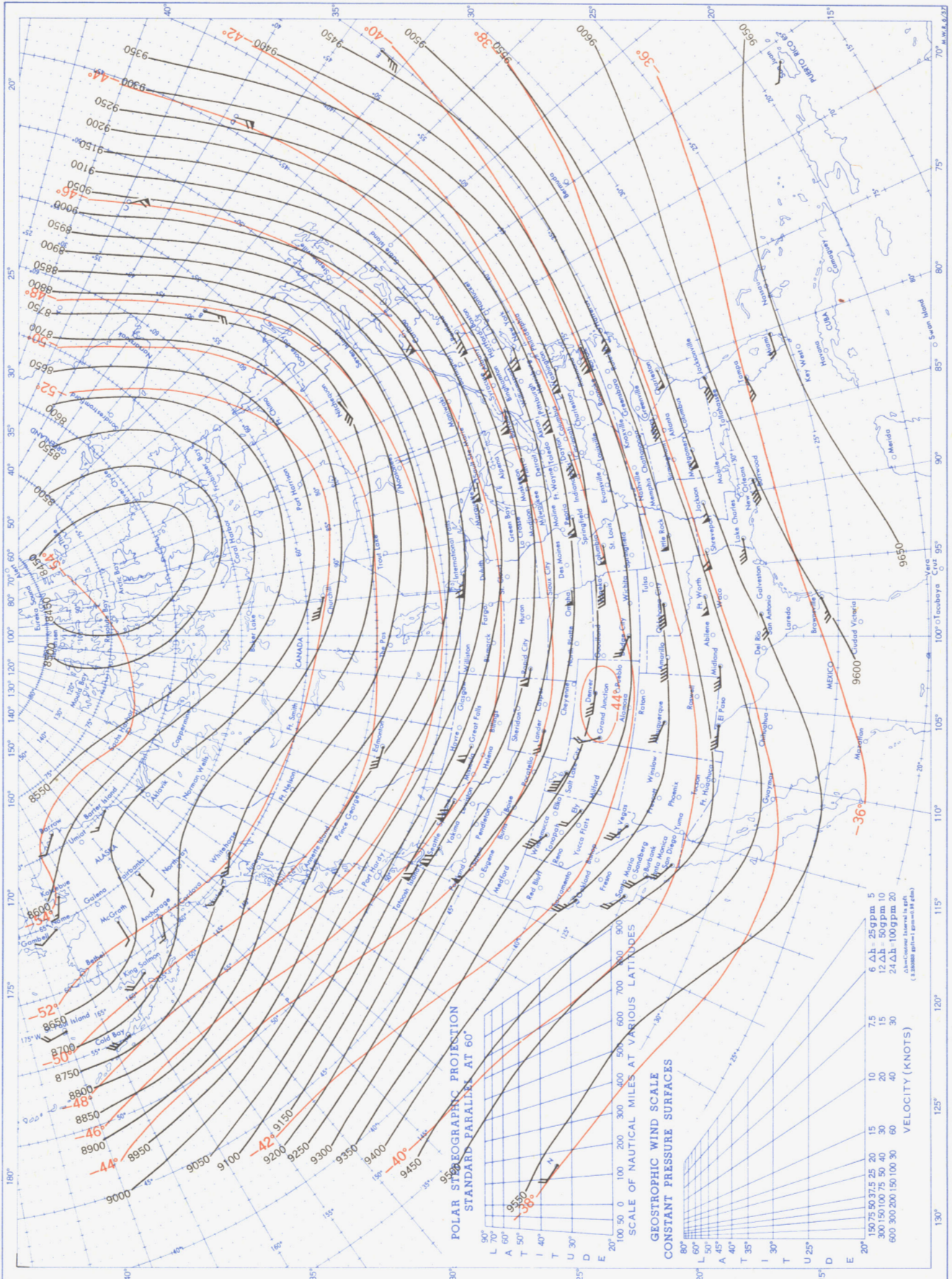
See Chart XII for explanation of map.

Chart XIV. 500-mb. Surface, 1200 GMT, November 1958. Average Height and Temperature, and Resultant Winds.



See Chart XII for explanation of map.

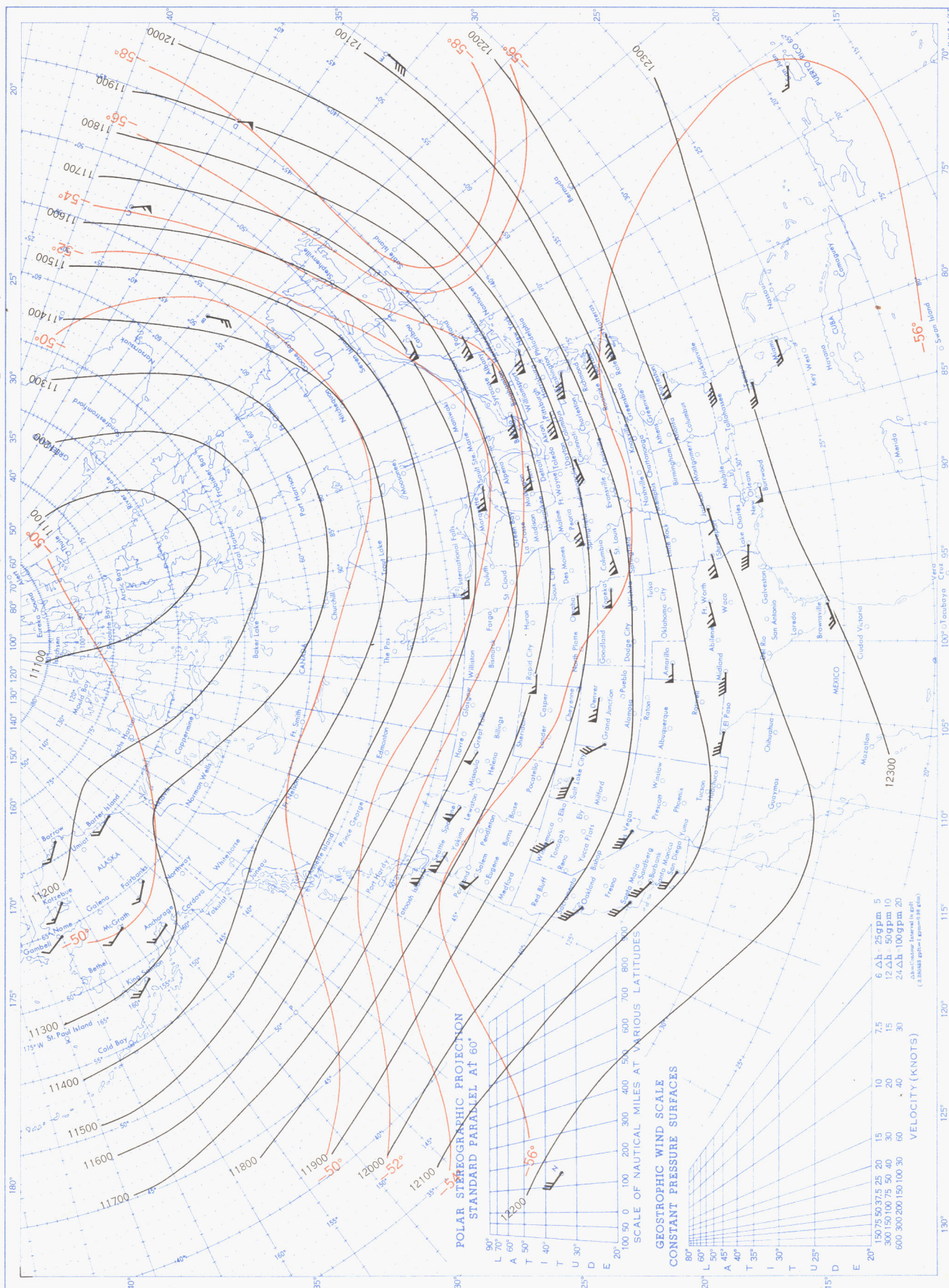
Chart XV. 300-mb. Surface, 1200 GMT, November 1958. Average Height and Temperature, and Resultant Winds.



See Chart XII for explanation of map.

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Chart XVI. 200-mb. Surface, 1200 GMT, November 1958. Average Height and Temperature, and Resultant Winds.



See Chart XII for explanation of map.

